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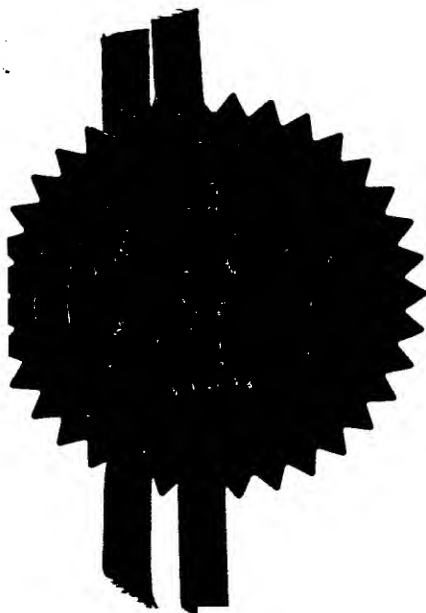
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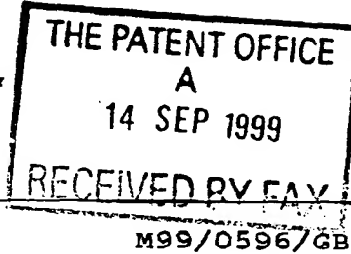
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**1/77**

# Request for grant of a patent

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Cardiff Road  
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1. Your reference

2. Patent a

(The Patent Office will assign a number to your patent)

**9921618.6**

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3. Full name, address and postcode of the or of each applicant (underline all surnames)

Reflec plc  
Road One  
Winsford Industrial Estate  
Winsford  
Cheshire CW7 3QQ

Patents ADP number (if you know it)

If the applicant is a corporate body, give the country/state of its incorporation

Great Britain

7737984001

4. Title of the invention

Retroreflective Materials

5. Name of your agent (if you have one)

"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)

McNeight & Lawrence  
Regent House  
Heaton Lane  
Stockport  
Cheshire  
SK4 1BS

Patents ADP number (if you know it)

0001115001

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (if you know it) the or each application number

Country

Priority application number  
(if you know it)

Date of filing  
(day / month / year)

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application

Date of filing  
(day / month / year)

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer 'Yes' if)

Yes

a) any applicant named in part 3 is not an inventor, or

b) there is an inventor who is not named as an applicant, or

c) any named applicant is a corporate body.

See note (d))

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Continuation sheets of this form

Description

9 ✓

Claim(s)

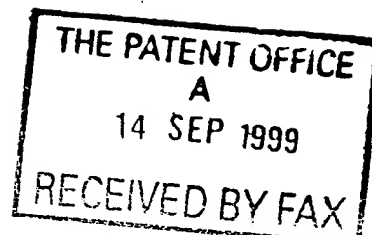
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Abstract

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Drawing(s)

-



10. If you are also filing any of the following, state how many against each item.

Priority documents

Translations of priority documents

Statement of inventorship and right to grant of a patent (Patents Form 7/77)

Request for preliminary examination and search (Patents Form 9/77)

Request for substantive examination (Patents Form 10/77)

Any other documents (please specify)

11.

I/We request the grant of a patent on the basis of this application.

Signature

Date 14.09.99

McNeight & Lawrence

12. Name and daytime telephone number of person to contact in the United Kingdom

David L McNeight 0161 480 6394

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### Notes

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### RETROREFLECTIVE MATERIALS

This invention relates to retroreflective materials, and particularly to such materials as are proposed in GB 2 321 565 for use as studio background material for chroma-keying and like purposes.

According to GB 2 321 565, such materials are made of a flexible sheet material coated with a plurality of retroreflective particles, randomly orientated. Usually, the retroreflective particles are glass microbeads which have been hemispherically coated with aluminium. In order to provide for high retroreflectivity at angles of incidence other than normal to the surface, GB 2 321 565 teaches that the material surface is not smooth, but has hills and troughs of size comparable to the diameter of the beads so that when viewed from an oblique angle, a substantial proportion of the spheres will be visible. This is said to produce substantially uniform reflectivity over a wide range of entrance angles.

Such uniformity is, of course, highly desirable for chroma-keying as well as for virtual studio effects, produced by projecting an image from the camera position on to a retroreflective background. Actors and props which do not retroreflect are not noticeably illuminated by the projection and appear to the camera to be in front of a real background. In situations where the viewing angle is wide, or where cameras are mobile, it is clearly important that the virtual image or chroma-key colour is of the same intensity from any angle.

GB 2 321 565 claims to achieve a normalised retro-reflectivity of at least about  $\frac{1}{4}$  at an angle of incidence of at least 60 degrees to the normal.

The retroreflective fabric is made, according to GB 2 321 565, by spray-coating or painting a thin layer of adhesive on to the cloth, or applying a sheet adhesive, for example that available from 3M Corporation under the trade name "Scotch". Suitable reflective spherical particles are said to be available from 3M as part of their reflective ink Kit 8010. These are intended to be embedded in an adhesive formulation supplied with the ink Kit and applied to a smooth surface as a reflective material. Improved performance is, however, said to be achieved, particularly at large angles of incidence, if the particles are disposed on a separate adhesive layer, i.e. no separate adhesive formulation.

GB 2 321 565 shows in graphical form (Figure 4) a comparison of the normalised gain of a conventional retro-reflective sheet material (as shown in Figure 4M) and of a retro-reflective material according to the method of the invention of Figure 4N. From Figure 4 it can be seen clearly that the invention provides more uniform retro-reflectivity, particularly at large angles of incidence.

The present invention provides retroreflective studio background materials, and methods for making the same, which have improved performance in terms of uniformity of normalised gain, and which are easier to make, as well as being more versatile.

The invention comprises a retroreflective studio background material comprising a fabric which is printed or coated with a one-pack ink comprising retroreflective elements in a polymer matrix, the fabric having a surface texture such that retroreflectivity remains substantially uniform from normal ( $0^\circ$ ) to high ( $60^\circ+$ ) angles of incidence.

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**Table II-** inks based on a polyvinylidene copolymer binder system and a combination of (3-aminopropyl) silanetriol and blocked hexamethylene diisocyanate trimer coupling agents

<b>Ingredient/Ink reference</b>	<b>V253</b>	<b>V254</b>	<b>V257</b>
Urea (Humectant)	10	10	10
Water	91	183	183
Ammonium phosphate buffer	20	20	20
Emulsifier WN (Dispersant)	2	2	2
Emulsifier HVN (Dispersant)	2	2	2
Agitan 218 (Defoamer)	2	2	2
Alcoprint PT21 (Thickening agent)	9.3	8	8
2,3 Propane diol (Humectant)	25	25	25
Polidene 33-048 (Binder)	273	181	181
Ammonium hydroxide	1.4	1.4	1.4
Silquest VS-142 (Coupling agent) [20% in water]	25	25	25
Trixene BI 7986 (Coupling agent)	40	40	40
Alcoprint PT21 (Thickening agent)	--	--	--
Metallised beads (40 micron) treated with sodium silicate and Silquest A-1170	500	500	400
Non-metallised beads treated with sodium silicate and Silquest A-1170	--	--	100
<b>Total Weight of Ink (g)</b>	<b>1,000.7</b>	<b>999.4</b>	<b>999.4</b>
Binder Volume %	15	10	10
Bead Volumes %	20	20	20
Binder Volume/Bead Volume Ratio %	75	50	50
Viscosity (pascals)	22.5	22.1	21.2
Temperature (°C)	19.3	19.0	19.0
pH	8.4	8.3	8.4

Generally speaking, the ingredients are added in the tabulated order. The thickener is added in two stages. Pigment, not tabulated, is added at the end in suitable quantity to yield the desired colour.

Viscosities were measured with a Brookfield viscometer using a number 5 spindle rotating at 10 rpm.

The suitability of any given fabric for use as a retroreflective studio background can be readily determined by printing or coating a sample and making the appropriate measurements. It is not at this time possible to predict precisely the performance of a fabric, though further development may enable this to be done from surface parameters.

Of importance also is the fact that it may not always be required to have a perfectly retro-reflective surface (or one as perfectly retro-reflective as possible). Combining the inks with different surfaces can produce, for example, a bright screen for projection in which light incident from a projector is reflected back over an angular extent corresponding to a viewing seating plan. The inks can indeed be applied to any surface, e.g. to a plaster wall, wood or metal surface, or to paper, to make an inexpensive viewing screen.

In one application, an outdoor viewing screen can comprise a lattice e.g. of polyvinyl chloride, say 10m x 12m in size, the lattice being waterproof but air permeable so as to be stable even in windy conditions. This is an example where the high resolution required for broadcast standard imaging (including chroma-keying) may be replaced by a lower resolution.

Less-than-perfectly retroreflective backdrops, screen and other surfaces may be used in connection with domestic, or undemanding commercial video. The inks,



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however, may be of the same specification, the difference being in the choice of surface or substrate.

The inks may, of course, be applied in any convenient manner. They can be printed using conventional screen or other printing techniques (the microbeads can be made small enough to pass through fine mesh screens), sprayed, coated and painted by brush or roller, for example.

As mentioned, the inks may be fire or flame retardant and may be applied to fire or flame retardant substrates, which is of importance in domestic and commercial situations as well as in broadcast and professional video and film studios.

The inks specified in the Examples are also wash resistant.

Other inks are specified in Examples III and IV below

**Table III** - inks based on a acrylic copolymer binder system and (3-aminopropyl) silanetriol coupling agent

<b>Ingredient/Ink reference</b>	<b>C202</b>	<b>C205</b>	<b>C208</b>
Urea (Humectant)	10	10	10
Water	154	179	179
Ammonium phosphate buffer	20	20	20
Alcoprint PDN (Dispersant)	2	2	2
Agitan 218 (Defoamer)	2	2	2
Alcoprint PT21 (Thickening agent)	8	8	8
2,3 Propane diol (Humectant)	25	25	25
Alcoprint PFL (Trimethoxymethyl melamine cross-linking agent)	15	15	15
Alcoprint PSM (Softening agent)	30	30	30
Alcoprint PBA (Acrylic copolymer binder)	300	225	225
Ammonium hydroxide	1	1	1
Silquest VS-142 (3-aminopropyl			

silanetriol coupling agent [20% in water]	25	25	25
Alcoprint PT21 (Thickening agent)	6	3	4.6
Metallised beads (40 micron) treated with sodium silicate and Silquest A-1170 (Bis[trimethoxysilylpropyl] amine)	400	450	400
Nonmetallised beads (40 micron) treated with sodium silicate and Silquest A-1170	--	--	50
<b>Total</b>	<b>997</b>	<b>995</b>	<b>996.6</b>
Binder volume %	12	9	9
Bead volume %	16	18	18
Binder volume/bead volume %	75	50	50
Viscosity	20.7	16.2	23.2
Temperature	16.6	16.6	16.6
pH	8.4	8.9	8.8

**Table IV** - inks based on a polyurethane binder system and a blocked 1,6 hexamethylene diisocyanate trimer coupling agent

<b>Ingredient/Ink reference</b>	<b>P96</b>	<b>P98</b>	<b>P102</b>
Urea (Humectant)	10	10	10
Water	62	187	187
Sodium Phosphate Buffer	10	10	10
Emulsifier WN (Dispersant)	3	3	3
Agitan 218 (Defoamer)	2	2	2
Alcoprint PT21 (Thickener)	3.0	3.1	3.0
2,3 Propane diol (Humectant)	25	25	25.1
Alcoprint PSM (Softener)	30	30	30
Witcobond 769 (Binder)	300	225	226
Trixene BI-7986 (Coupler)	50	50	50
Alcoprint PT21 (Thickener)	0.7	4.0	3.0
Metallised beads treated with sod.silicate and Silquest A-1170	500	450	400
Non-metallised beads treated with sod.silicate and Silquest A-1170	--	--	70

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<b>Total Weight of Ink (g)</b>	993.7	999.1	1,019.1
Binder Volume %	12	9	8.8
Bead Volume %	60	18	18.5
Binder Volume/Bead Volume Ratio %	60	50	47.9
Viscosity (pascals)	O/R	31.0	32.0
Temperature (°C)	18.8	18.2	18.5

These may be suitable for application to some surfaces.

As well as (or in some instances instead of) microbeads, retroreflectivity may be achieved by flake material, e.g. flake mica, and unmetallised beads may be used in conjunction with such flake material or with metallised beads to create special effects.

The inks may be coloured e.g. by incorporating pigments.

While one-pack inks have been particularly referred to, it would, of course, be possible to provide ingredients separately, e.g. binder, beads and pigment, so that an appropriate bead size and pigment colour could be selected at time of use. There are, however, clear advantages to be had from a one-pack system inasmuch as control over the manufacture will ensure a constant quality level, not to mention the trouble saved in mixing. The various treatments involved, however, in connection with the one-pack formulation render the inks suitable for all the purposes described herein, notwithstanding that the ink, for whatever reason, might be presented as a two or three pack system.

### CLAIMS

1. A retroreflective studio background material comprising a fabric which is printed or coated with a one-pack ink comprising retroreflective elements in a polymeric matrix, the fabric having a surface structure such that retroreflectivity remains substantially uniform from normal ( $0^\circ$ ) to high ( $60^\circ+$ ) angles of incidence.
2. A material according to claim 1, comprising a woven fabric having conspicuous warp and weft crowns.
3. A material according to claim 1, comprising a knitted fabric having a conspicuous stitch structure.
4. A material according to any one of claims 1 to 3, printed or coated in solid colour for chroma-keying.
5. A material according to any one of claims 1 to 3, printed in a pattern or design.
6. A material according to claim 5, printed in different colours of retroreflective ink.
7. A material according to claim 5, printed or coated in a single colour of retroreflective ink and overprinted with a pattern or design.
8. A material according to claim 7, in which the overprinting is by transfer, e.g. heat transfer printing.
9. A material according to any one of claims 1 to 8, which is fire or flame retardant.